EE96

An “R-Shiny” Tool for Estimating Transition Probabilities From Various Published Literature for Health Economic Models

Pandey S[1] , Pandey K[1] , Tripathi N[1] , Bajaj P[1] , Sharma A[2]
[1]Heorlytics, Mohali, India, [2]Pharmacoevidence, Mohali, India

Conclusion

Decision modelers encounter various challenges when incorporating transition probabilities from published data, including the reliance on comparative statistics (e.g., RRs or ORs) and the need to align data with the model's cycle length. This tool offers a solution, enabling modelers to populate their models with precise transition probabilities effortlessly, even without prior programming or statistical knowledge

Background

- Decision models rely on a foundation of health states or events, along with their associated probabilities of transitioning between states over a specified time period, known as “transition probabilities”.
- Modelers face challenges converting non- probabilistic data (counts, rates etc.) from published source into probabilities. Additionally, matching the cycle length of decision models with published probabilities, which may differ (e.g., annual vs. 6-month cycles), poses another common challenge.
- This tool aims to gather evidence on transition probability calculations from various sources for economic models, consolidating it into an open-source unified R-shiny platform.

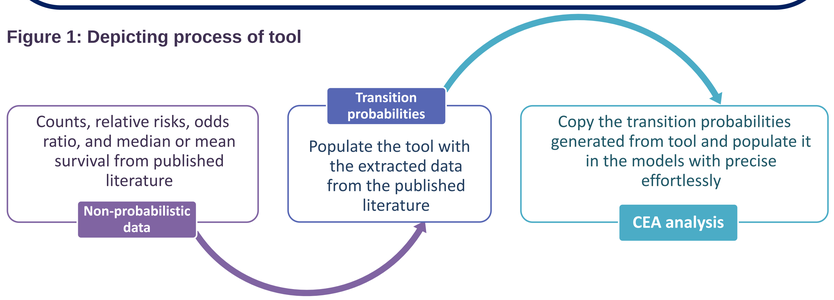
Objective

- To gather evidence on transition probability calculations from various sources for economic models, and consolidating it into an open-source unified R-Shiny tool

Methodology

- The tool was developed using “R-shiny” package in R (v 4.3.3)
- The tool was deployed on Amazon Web Services (AWS) using a Docker container, enhanced with Secure Sockets Layer (SSL) certificates
- User authentication is handled by Auth0. Importantly, any data uploaded during an active session exists only temporarily and is not stored on any server

Figure 1: Depicting process of tool



Methodology (Cont’d)

- All the formulas used in the tool is for risk ratios and survival outcomes are detailed in the references [1,2]
- The tool incorporates following data from the published literature to generate the transition probabilities for economic models:
- **Risk ratios**
  - Convert relative risk or risk ratio (RR) to probability of event in treated group (when probability of event in the untreated group is given)
  - Using relative risks or risk ratios to derive subgroups transition probabilities
- **Odds ratios**
  - Convert odds of an event to the probability of an event
  - Convert odds ratio to the probability of an event (by deriving RR first)
  - Convert odds ratio to the probability of an event (if log odds is given)
- **Survival outcomes**
  - Convert median survival time to the probability of an event (assuming exponential distribution)
  - Convert mean survival time to the probability of an event (assuming exponential distribution)
  - Convert hazard ratio to the probability of an event in the treated group
- **Probability to rate conversion**
  - Convert probability to instantaneous rates (assuming exponential distribution)
  - Convert constant rates to probability (assuming exponential distribution)
  - Convert probability from one time frame to another (assuming constant rate over time)
- **Figure 1** presents the process of using the tool

Results

- An R-based web application using the R-Shiny tool was developed and deployed in open source (scan the QR at below of the poster to access the tool) using AWS and SSL certificates
- **Figure 2** illustrates the landing page layout of the tool, featuring a navigation pane on the left for convenient access to various data types necessary for generating transition probabilities

Figure 2: Layout of tool

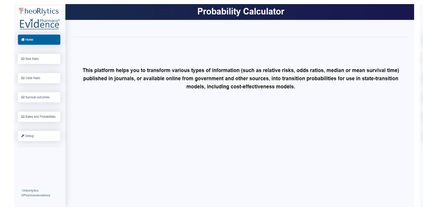
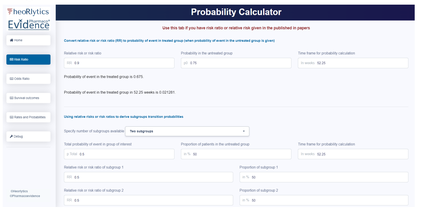


Figure 3: Hypothesized example



- **Figure 3** presents a use case: The risk ratio of treated versus untreated group (0.6) and the probability of an event in the untreated group (0.75) is given in the published paper and the objective is calculate the probability of an event in the treated group in 2 years
- The tool is also equipped with validation checks and producing the errors in case of implausible results. **Figure 4** presents a similar situation where the calculated probability in the treated group is more than 1

Figure 4: Layout of tool

Disclosure

AS, SP and BS, the authors, declare that they have no conflict of interest

References

1. Gidwani R, Russell LB. Estimating Transition Probabilities from Published Evidence: A Tutorial for Decision Modelers. Pharmacoeconomics. 2020 Nov;38(11):1153-1164. doi: 10.1007/s40273-020-00937-z. Erratum in: Pharmacoeconomics. 2020 Sep 8;. PMID: 32797380; PMCID: PMC7426391.
2. Chang W, Cheng J, Allaire J, Sievert C, Schloerke B, Xie Y, Allen J, McPherson J, Dipert A, Borges B (2024). shiny: Web Application Framework for R. R package version 1.8.1.9000, https://github.com/rstudio/shiny, https://shiny.posit.co/.
3. Survival conversions: https://stattools.crab.org/R/Help%20Documents/Survival_Converter_HelpDoc.html
4. For deployment: https://www.shinyapps.io/

Scan the QR code to access the platform on the device and Enjoy!

For further queries, please contact: Shubhram.Pandey@heorlytics.com